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DETECTION SEISMOLOGY

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## I RESEARCH PROGRAM

### Noise.

A revised version of Scientific Report No 4 with the title "Short Period Seismic Noise Structure at the Norwegian Seismic Array" has been under preparation for publication.

### Surface wave studies.

In order to deal most effectively with the already existing data base of the recordings of the standard stations and the Lillehammer station a reasonably quick and nonexpensive way of digitizing seismograms was intended developed. This has been done by modifying an instrument developed at the Seismological Institute and originally designed for reading and punching phases from seismic profiling records. The instrument does not give equispaced data points, but a computer program has been added removing data points with zero or negative time steps. Also, for filtering purposes etc, an equispaced version of the trace is produced by simple interpolation.

With this equipment the digitizing of long period signals takes about 1-2 min per min. recording depending on the complexity and amplitudes of the seismograms.

Examples of digitized traces and spectra are shown in figs. 1-3. The amplitude spectra were calculated for every 0.005 Hz with a rectangular data window and no additional smoothing. Fig. 1 shows a typical Rayleigh wave train of a Sinkiang earthquake as recorded at Lillehammer, with the energy concentrated around 0.05 Hz, some higher frequency content around 0.09 Hz, and very little power at lower frequencies. (The particular time scale is due to stepwise magnification of the film recordings. Only integers are given at the time axis). With reference to this and the following figures the amplitude spectrum can be used to establish the frequencies inside which the chirp filters for particular regions should be defined. With the additional limitations put forward by the extension of the signal the class of filters applicable for particular regions may be effectively reduced.

Fig. 2 shows a digitized and diminished Love wave train from Peru recorded at Kongsberg. The upper trace is lowpass-filtered at 0.1 Hz. One side of the symmetric filter is shown on top. In fig. 3 the Rayleigh wave train and its spectrum of a Novaya Zemlya atmospheric explosion is given. The tendency of beating in the signal and the lack of smoothness of the spectrum is noteworthy since it reflects a general relation between the time signal and its spectrum.

### Magnitude studies.

In order to find out if regional anomalies in magnitudes calculated from recordings at Norwegian stations can be expected, we have compared body wave magnitudes calculated from Kongsberg seismograms with those reported by USCGS. In fig. 4  $m_b(KON) - m_b(USCGS)$  residuals for 170 events are plotted versus azimuth from Kongsberg. These events were all reported by USCGS to have magnitudes equal to or greater than 5.0. Fig. 4 shows that the Kongsberg magnitudes are azimuthal dependant, but for most directions the data coverage is too scarce to

permit us to give the station-corrections as a function of azimuth.

The sector with the best data coverage is  $0^{\circ}$  -  $50^{\circ}$  and averaging over  $10^{\circ}$  intervals the residuals are:

Azimuth:	Average $m_b(\text{KON}) - m_b(\text{USCGS})$ residuals:	Number of events:
$0^{\circ} - 10^{\circ}$	0.15	8
$10^{\circ} - 20^{\circ}$	0.13	9
$20^{\circ} - 30^{\circ}$	0.14	25
$30^{\circ} - 40^{\circ}$	- 0.10	29
$40^{\circ} - 50^{\circ}$	- 0.41	5

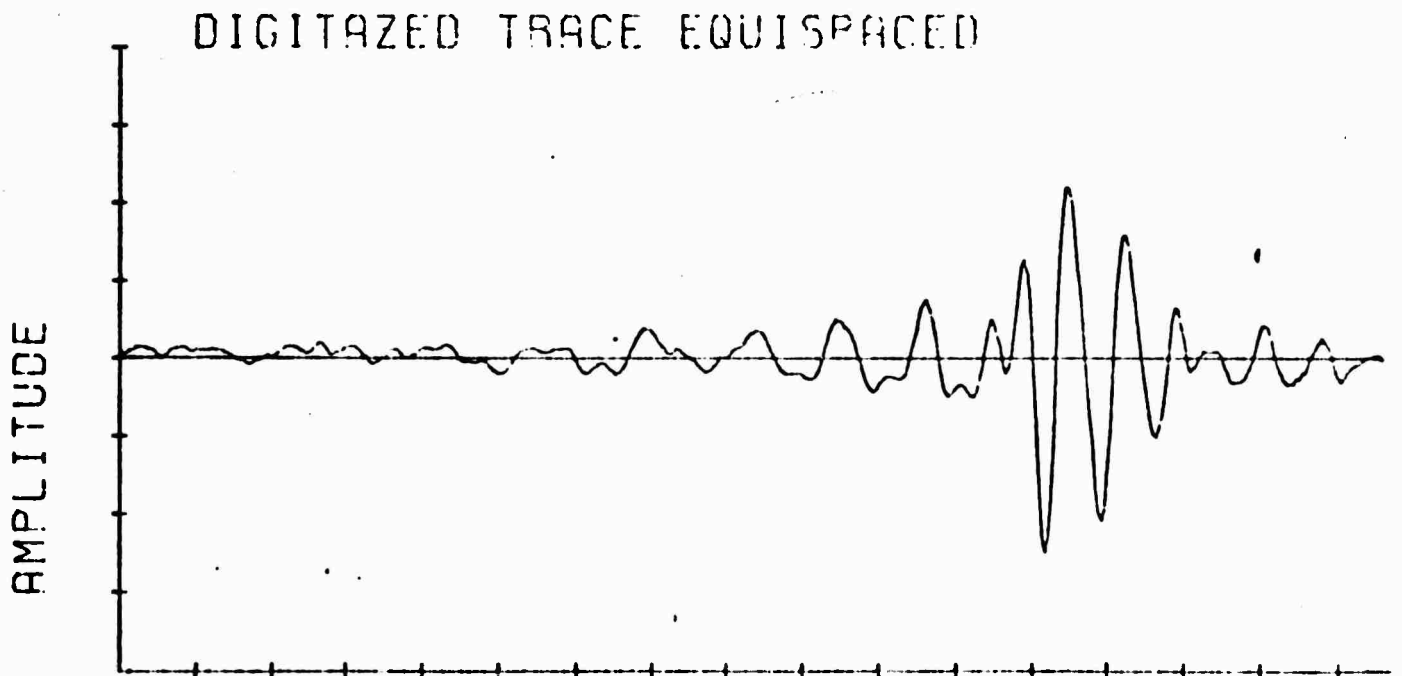
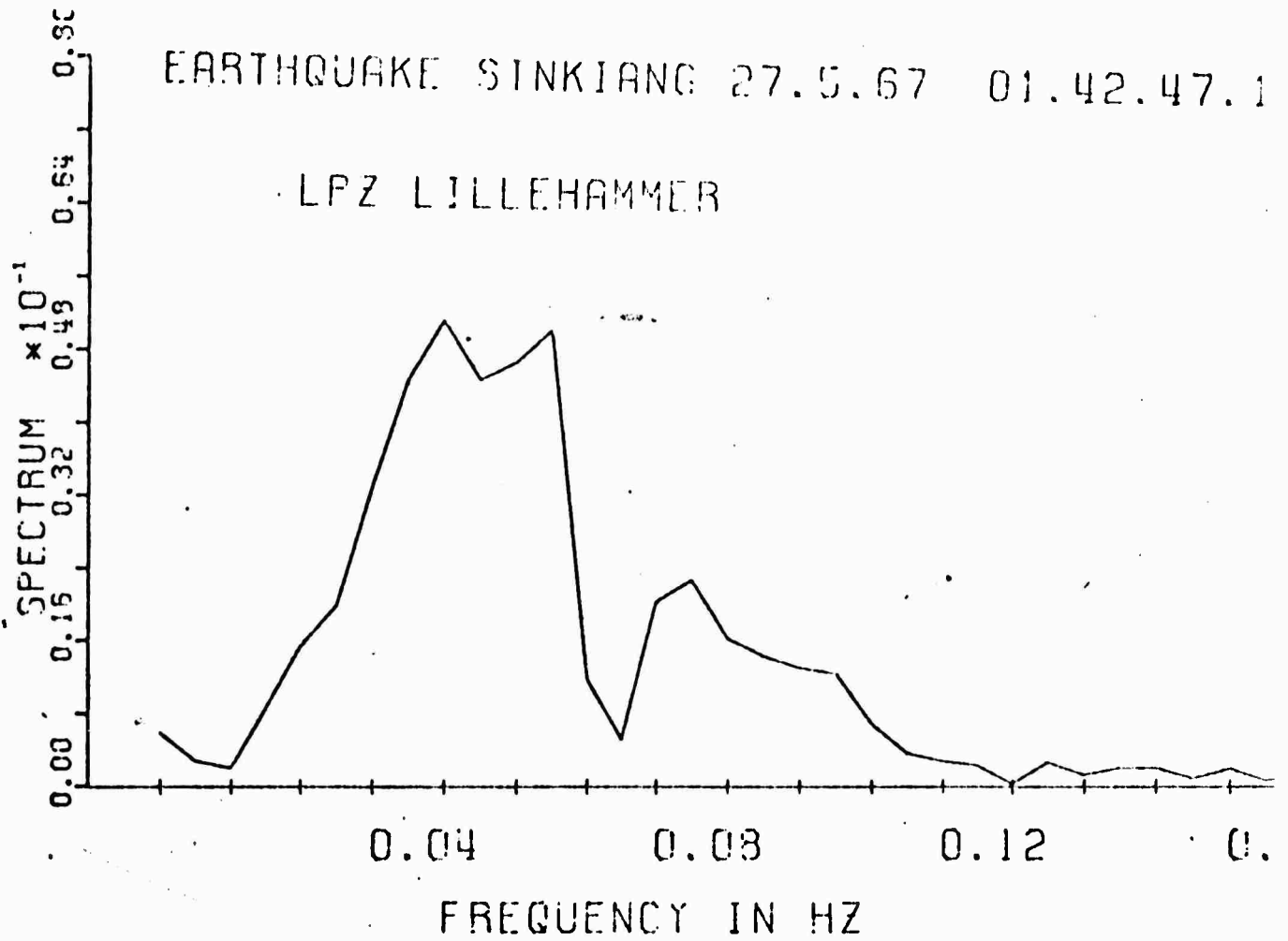
## II. THE PERSONNEL

There has been no changes in the personnel during the time period covered by this report.

## III. ADDITIONAL INFORMATION

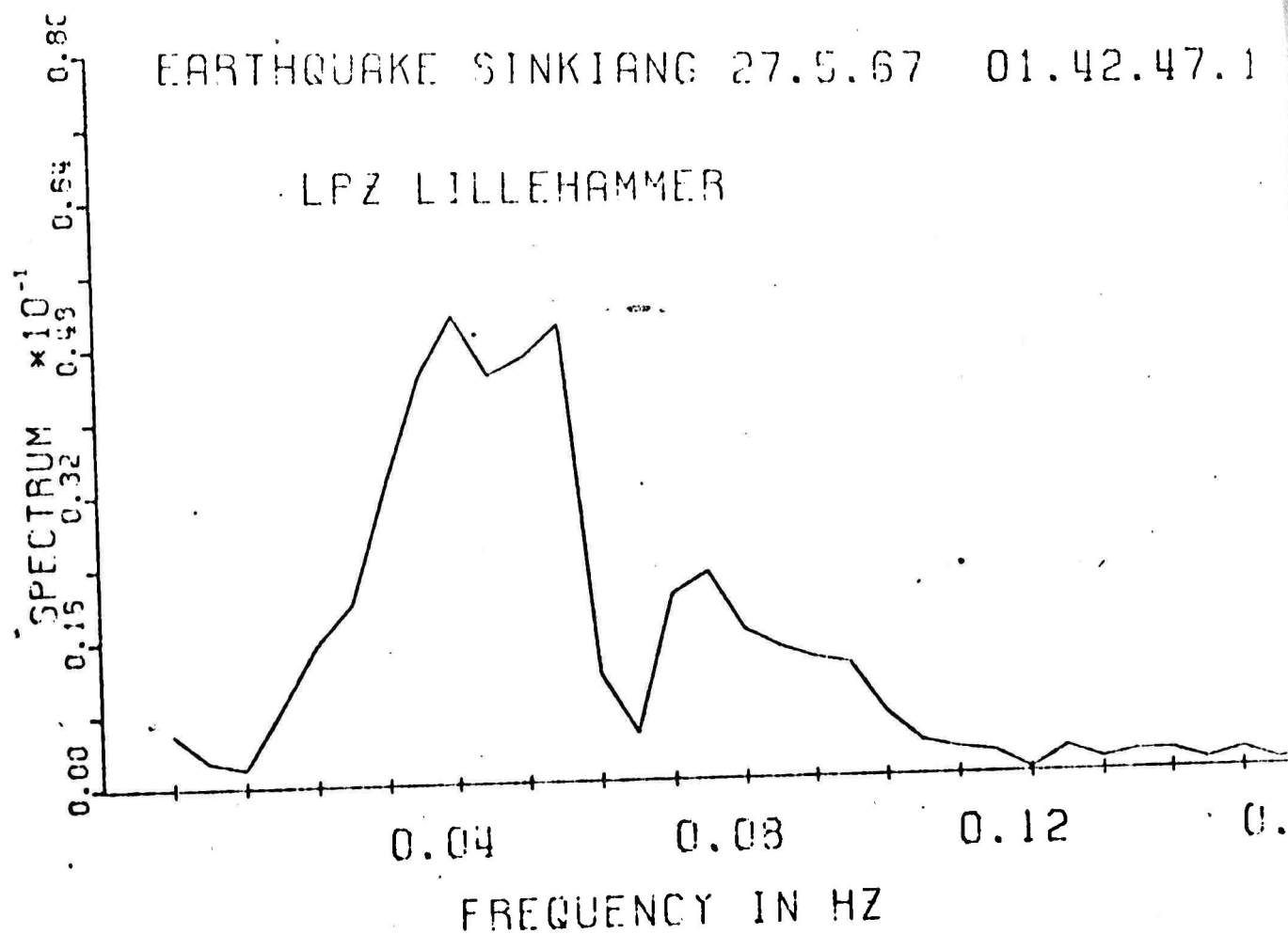
The seismological stations Kings Bay and Kongsberg have been in regular operation. The LP instruments from the Lillehammer Array are installed in Bergen and have been run for testing during the period.

FIG 1



EARTHQUAKE SINKIANG 27.5.67 01.42.47.1

LPZ LILLEHAMMER



DIGITIZED TRACE EQUISPACED

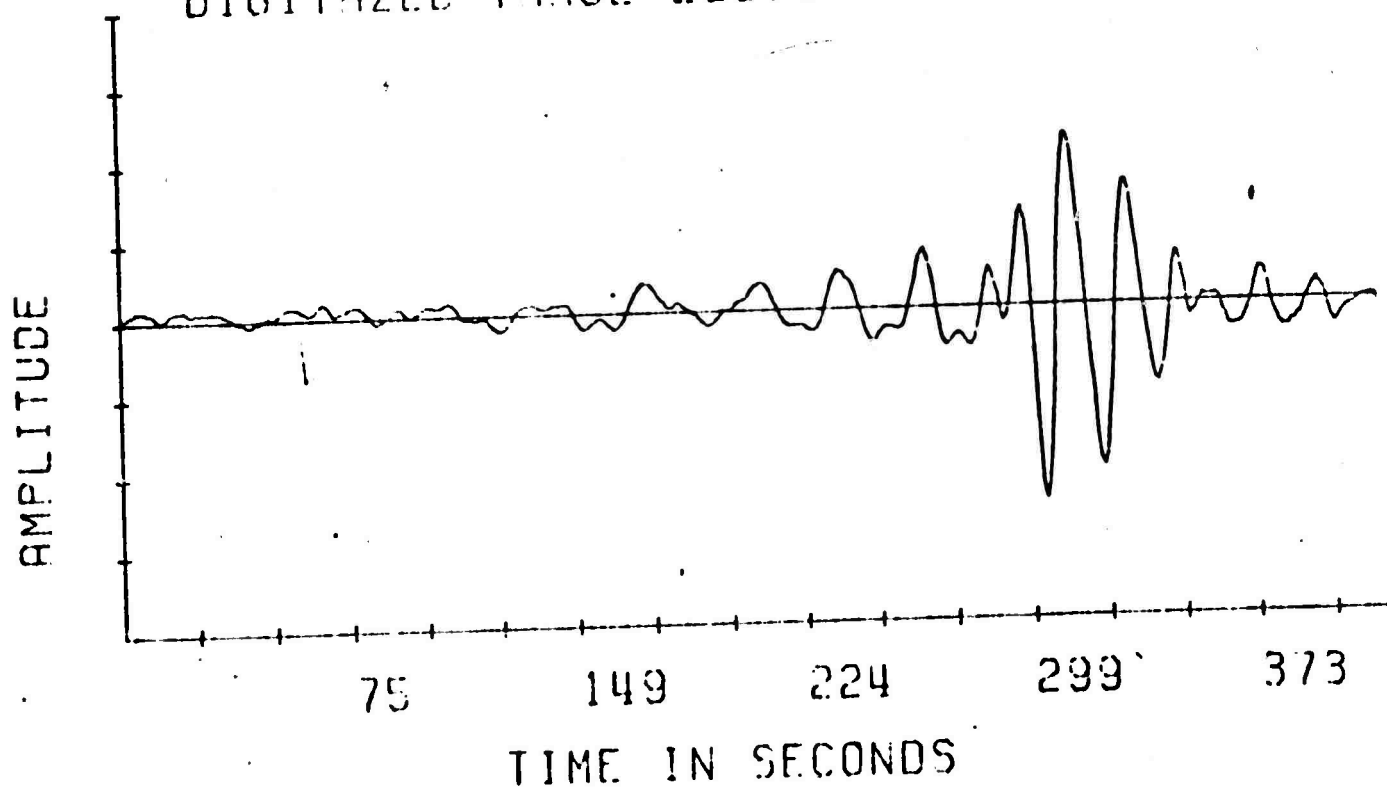


FIG 2

JORDER13

KONGSBERG 1 JUNE 1970 LPNS PLOT STARTS AT 18.18.00

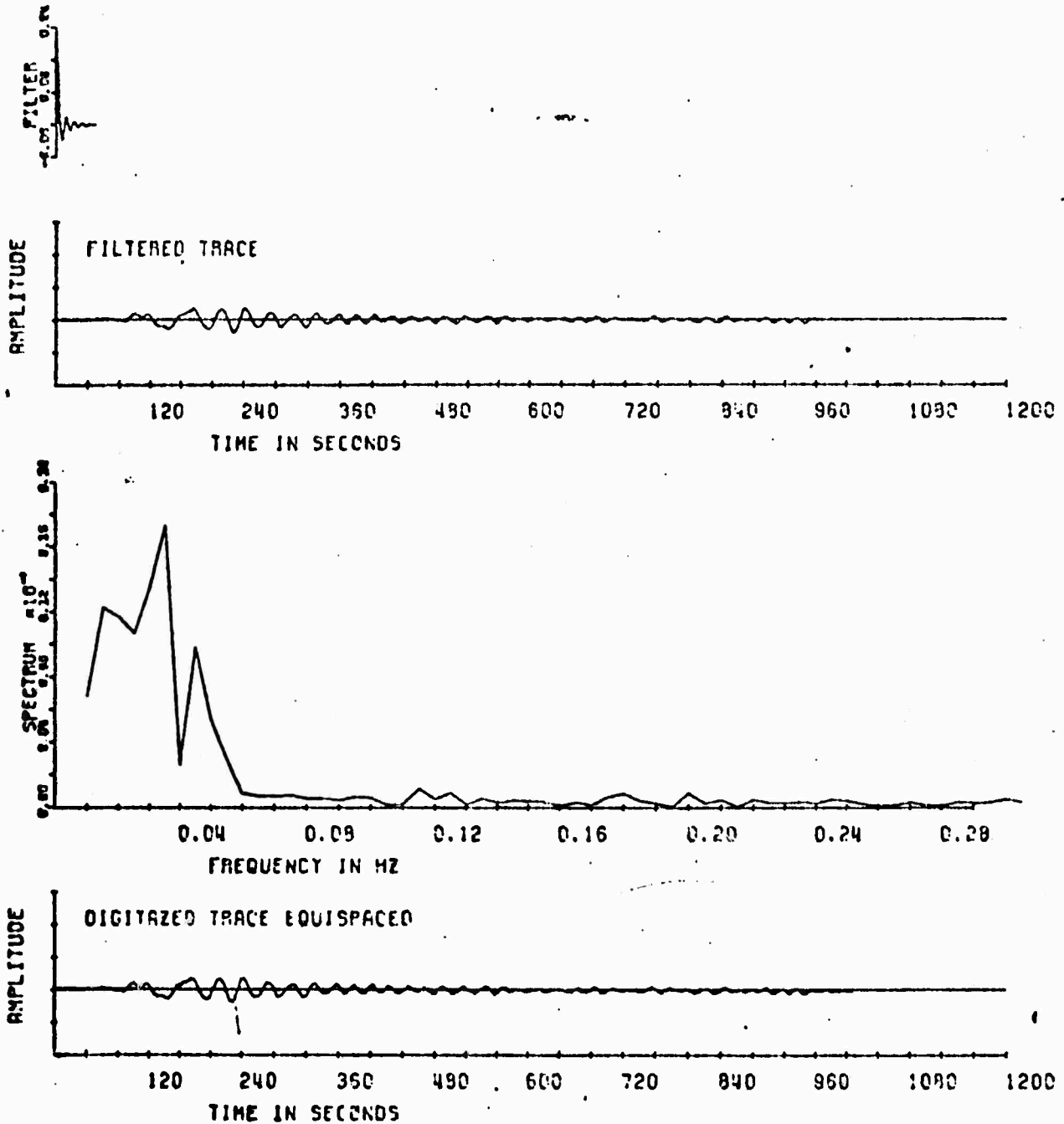
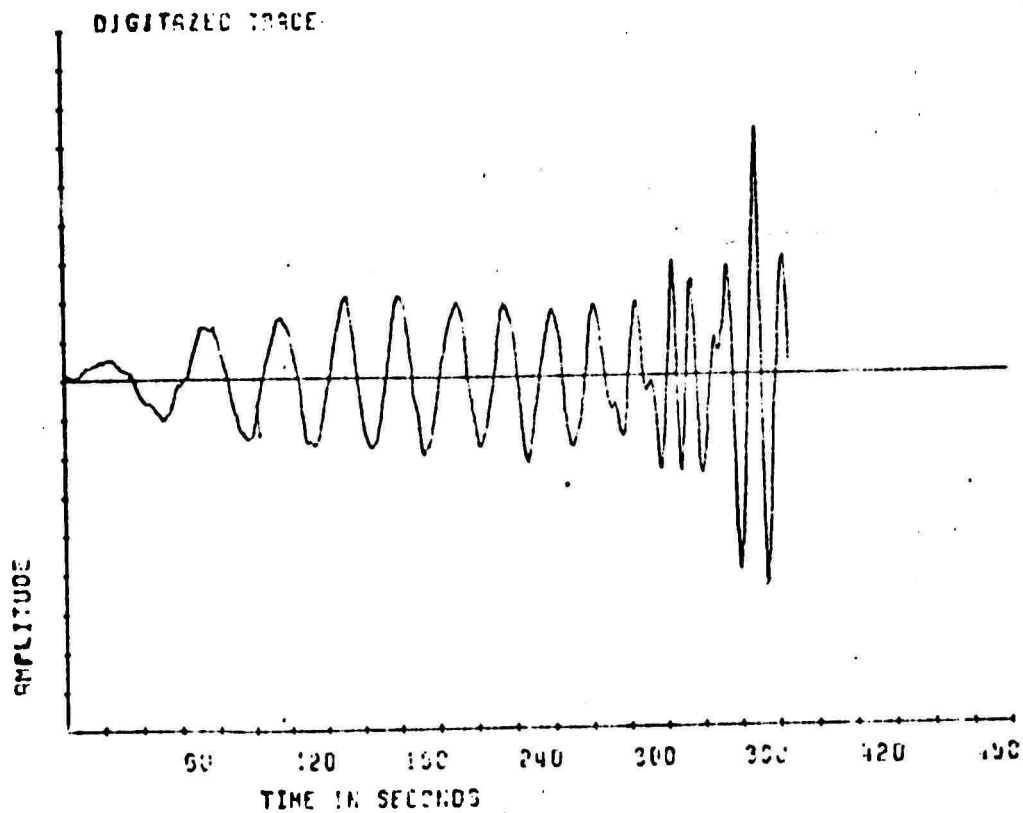
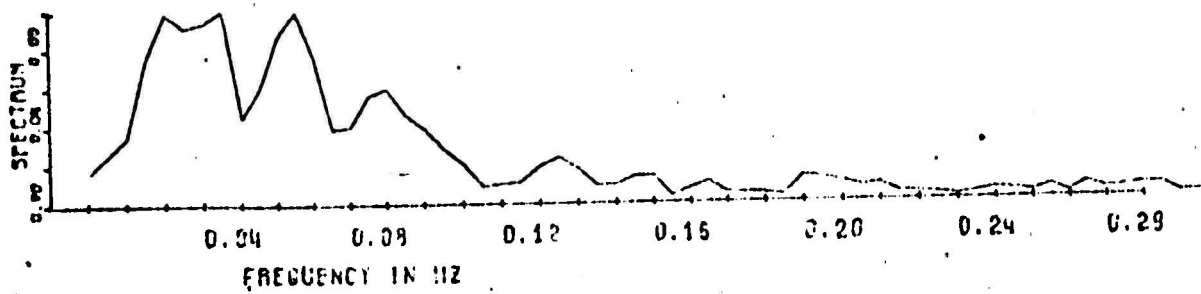
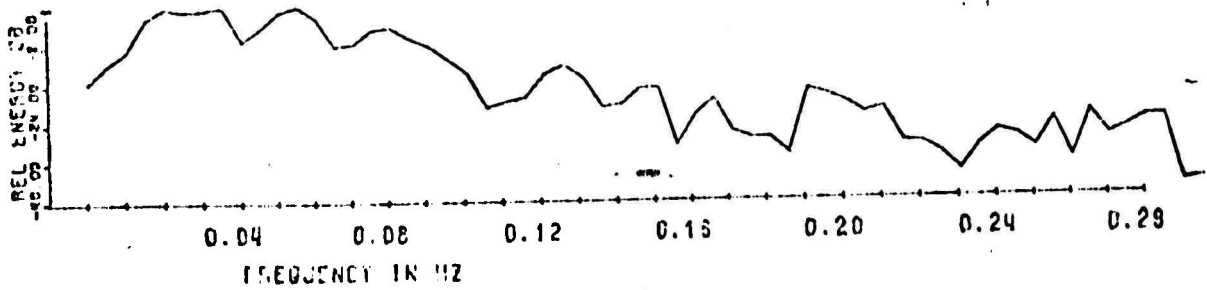




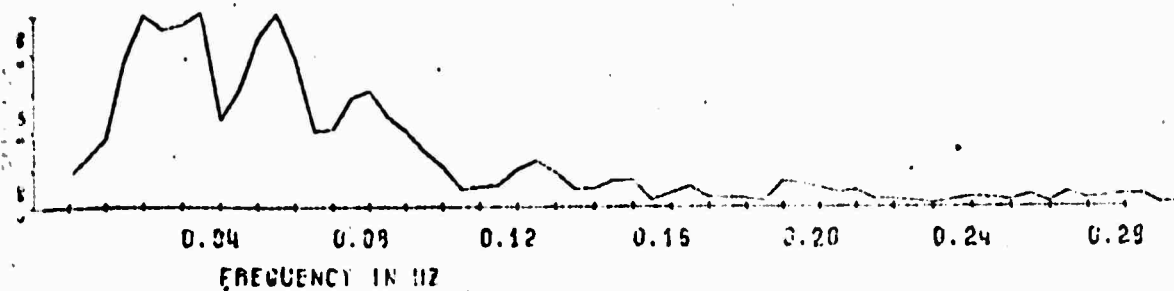
FIG 3

JORDEN

STM. NUCLEAR EXPLOSION NOVAYA ZEMLYA 19.9.52 KONDENSED LP2



RTM. NUCLEAR EXPLOSION NOV/RTM ZEM/TH 19.9.57 RANGING 017



DIGITIZED TRACE

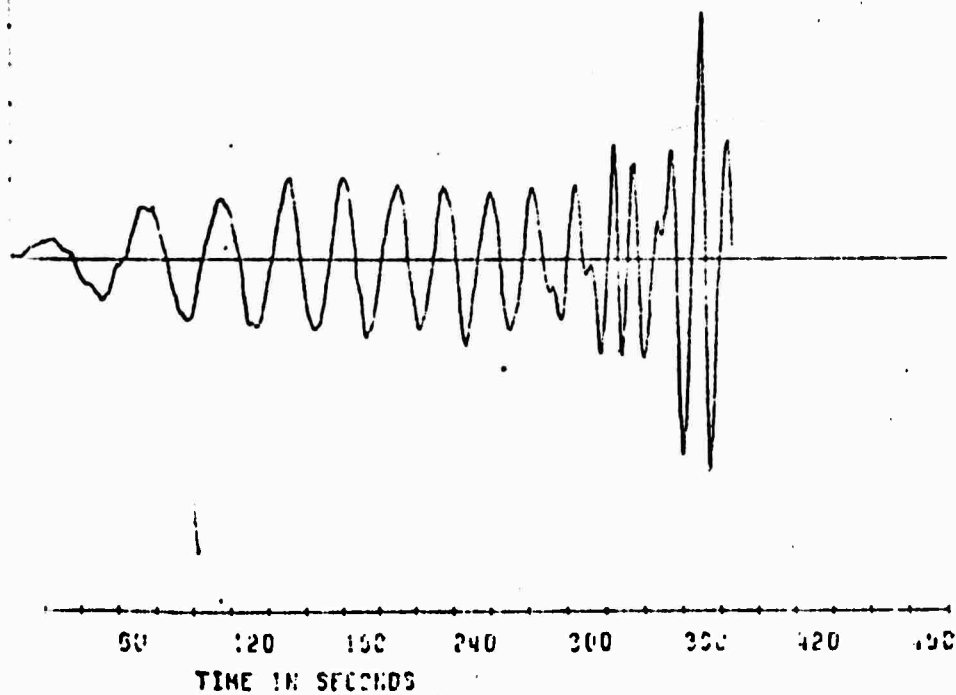
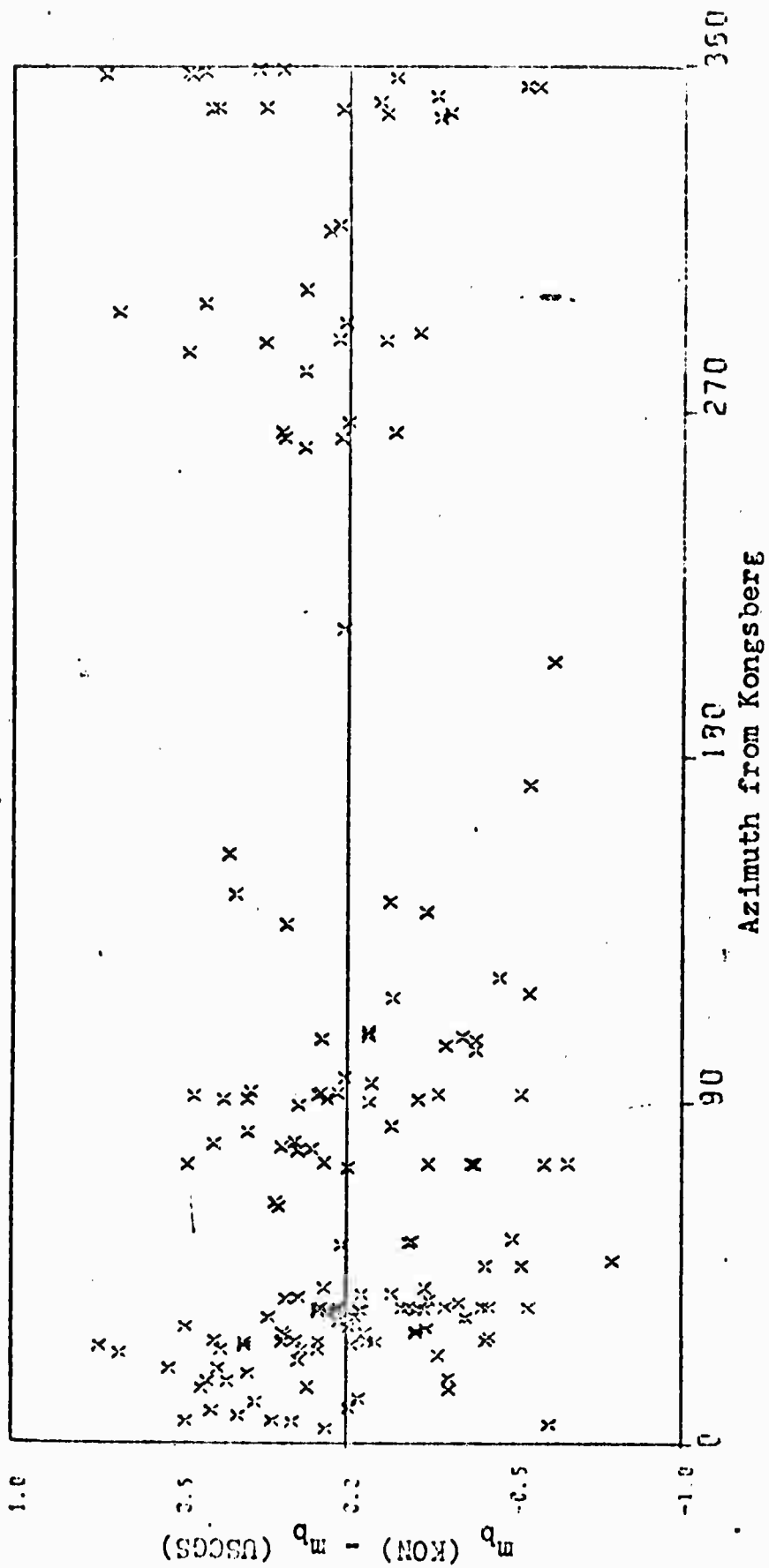
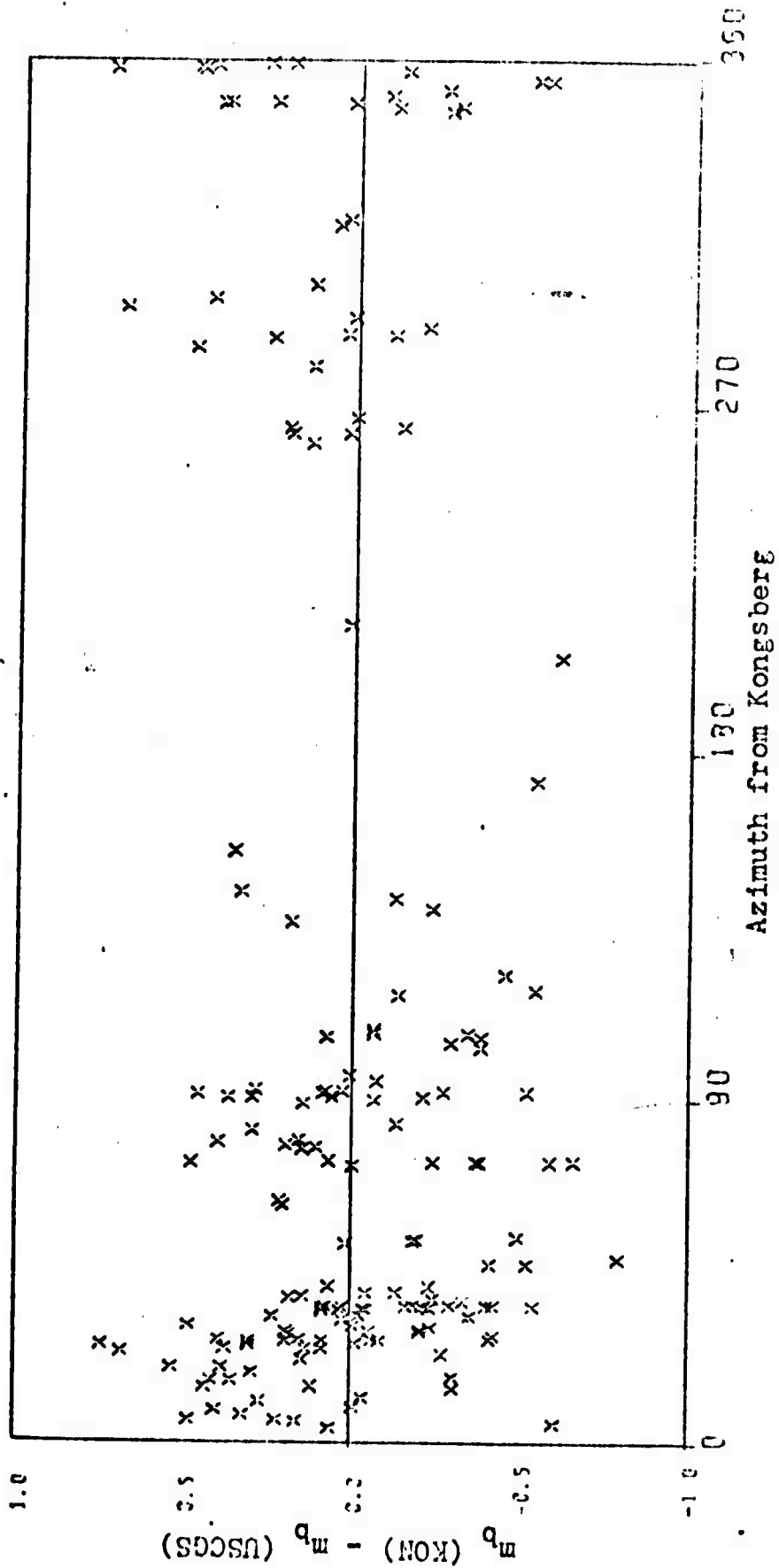


FIG 4



Magnitude residuals versus azimuth

FIG 4



Magnitude residuals versus azimuth

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ABSTRACT

Research Program covers noise, surface wave studies, and magnitude studies.